9.0

Solid Waste Element

Table of Contents

List of Tables

9.0 Solid Waste Element

Solid waste management is a critical issue in the Florida Keys. While problems of landfill sitings, facilities financing and hazardous waste disposal have increased throughout Monroe County, the unique setting of the Keys makes waste management even more difficult. The geographic isolation, the limited land area, the environmental constraints, and the presence of nationally significant natural resources add to the challenge of responsibly and efficiently managing the Keys' solid waste stream.

While landfilling is the predominant means of waste disposal nationwide, our nation is becoming increasingly conscious of what is being thrown away and where it is going. An increasing awareness of the hazards of landfilling some types of wastes, of the potential for reuse of other materials, and the imminent closure of over ninety percent of the landfills in the country has brought about this change in attitudes towards solid waste management. Now, methods of processing and disposal are evolving that are changing the business of solid waste management.

Florida and the Keys have not been left out of this trend toward more complex, yet more efficient and healthier use of what was once considered simply waste. Landfills filled to capacity, new State laws, and public concern over present volume reduction and disposal methods have altered the direction of solid waste management in Monroe County significantly over the past few years.

The current solid waste management system for Monroe County, the problems and opportunities specific to the County, and the future solid waste management plans and levels of service are detailed in this element.

9.1 Background Information

9.1.1 Types of Solid Waste

The solid waste generated by a community is made up of many different types of wastes, which for public health, safety, and cost effectiveness should be disposed of in different ways. In general, solid wastes include garbage, refuse, yard trash, clean debris, white goods, special wastes, ashes, sludge or other discarded material including solid, liquid, semisolid or contained gaseous material resulting from domestic, industrial, commercial, mining, agricultural or governmental operations (Chapter 403.703(13), F.S.).

Solid waste generated in the County is comprised of:

(a) Residential Solid Waste: the garbage generated by households. Yard trash, recyclables, and sometimes hazardous wastes are also generated by households, but should ideally be separated from other residential solid waste.

(b) Commercial Wastes: the wastes generated by the commercial and institutional sectors, including stores, offices, restaurants, warehouses, schools, hospitals, motels, churches and other non-manufacturing and non-processing establishments.

(c) Industrial Wastes: those wastes generated by industrial and manufacturing operations engaged in the processing and production of marketable goods. Although a significant amount of construction and demolition debris is generated in the County, and the County has designated some areas of the Keys in an "industrial" land use category in the past, none of the municipal solid waste generated in Monroe County is classified as industrial waste. Construction and demolition debris is a separate category of "special wastes." Businesses that fall within the industrial land use category on the Existing Land Use Map series are classified for solid waste management purposes as "commercial generators."

(d) Special Wastes: those that require special handling and management, including but not limited to white goods (large household appliances such as washing machines), whole tires, used oil, hazardous wastes, lead-acid batteries and biological wastes (Chapter 403.703(34), F.S.). Abandoned autos are also a special waste requiring separate handling.

(e) Hazardous Wastes: special wastes which, because of the quantity, concentration, or infectious characteristics may cause or significantly contribute to an increase in mortality rates or an increase in the rate of serious irreversible or incapacitating reversible illness. Wastes are also hazardous if they pose a substantial present or potential hazard to human health or the environment when improperly transported, disposed of, stored, treated or otherwise managed. Common examples include waste oil, dry cleaning fluid, photo processing chemicals, and medical wastes. In some cases, wastes that are not hazardous alone become hazardous if mixed with certain other materials (Rule 9J-5.003(34), F.A.C.).

(f) Biohazardous Wastes: any solid or liquid wastes which may present a threat of infection to humans (Rule 17-712.200(2), F.A.C.).

(g) Recyclables: any solid waste that can be separated out of the waste stream, processed, and reused or transformed into raw materials or products. These include: paper, cardboard, yard waste, wood, plastics, scrap iron, aluminum, and glass.

9.2 Regulatory Framework

9.2.2 Federal Regulations

The federal government regulates solid waste in order to minimize the potential for environmental impacts, and to encourage resource recovery. The U.S. Environmental Protection Agency (EPA) reviews solid waste management facilities for air and water quality impacts. The U. S. Army Corps of Engineers, along with the Florida Department of Environmental Regulation (DER), regulate filling activities in wetlands. The 1976 Federal Resource Conservation and Recovery Act (PL 94-580) removed the regulatory constraints that impeded resource recovery in order to encourage states to conserve materials and energy.

The Resource Conservation and Recovery Act also addresses the regulation of hazardous wastes. Pursuant to this Act, EPA has set forth guidelines and standards for the handling of hazardous wastes, and directs state agencies, including Florida's DER, to regulate hazardous waste management. To aid in hazardous waste management financing, the EPA "Superfund" Program was established by the Comprehensive Emergency Response and Compensation Liability Act of 1980. This Act provided EPA with the funds to respond to sites requiring clean-up and emergency mitigation, and allows local governments to apply for funding of their hazardous waste management projects.

9.2.3 State Regulations

Besides EPA regulation, the environmental impacts of solid waste are regulated at the state level by the Florida Department of Environmental Regulation (DER). The DER follows the solid waste management guidelines set forth in Rule 17-701, F.A.C. when permitting solid waste facilities. Specifically, the DER has established evaluation criteria for the construction, operation, closure and long-term care of landfills. The agency also regulates the handling, classification and disposal of wastes, as well as resource recovery operations.

The 1974 Florida Resource Recovery and Management Act (Chapter 403.701, F.S.) required each county to prepare a Solid Waste Management Plan. In 1988 this Act was amended by the Solid Waste Management Act to establish state goals, regulations and programs for a host of solid waste activities. A central focus of the amendment is recycling. It mandates that counties recycle thirty percent of their total municipal solid waste by December 1994, and requires counties and municipalities to have initiated recycling programs by July 1, 1989. No more that half of the 30% can be met with yard trash, white goods, construction debris and tires. It requires that, at minimum, a majority of newspaper, aluminum cans, glass and plastic must be separated from the solid waste stream and offered for recycling. The State imposes deadlines for the separate handling of various special wastes, including construction and demolition debris, yard waste, white goods and used batteries and oil, to divert their disposal away from the landfills. Composting of other mechanically treated solid waste and yard trash is also encouraged.

Additionally, the new law requires municipalities to determine the full cost of solid waste management, to update it annually, and to provide this cost information to consumers. Other changes include the establishment of a Solid Waste Management Trust Fund to encourage innovative solutions to solid waste management and recycling, and encouragement of the use of enterprise funds to operate solid waste services.

Chapter 403, F.S. also regulates hazardous and biohazardous wastes. It outlines requirements and procedures for the storage, transport, disposal and treatment of hazardous wastes. Pursuant to federal EPA regulations, the Florida DER is responsible for hazardous waste management programs in the state. The law also prohibits the construction of new hazardous waste landfills in Florida.

9.2.4 Local Regulations

The Monroe County Land Development Regulations, in compliance with State concurrency requirements, require that: "sufficient capacity at a solid waste disposal site shall be available to accommodate all existing and approved development for a period of at least three years from the projected date of completion of a proposed development or use" (Section 9.5-292(a)(2)). This regulation went into effect on February 28, 1988, and serves as a level of service standard for solid waste disposal. The exact quantity that constitutes "sufficient capacity," however, is not defined in the Land Development Regulations.

The determination of sufficient capacity is assessed on an annual basis. As stipulated in Section 9.5-292(b)(3), capacities for solid waste and other public facilities are updated and presented each year in a Public Facilities Capacity Assessment that is approved by the Board of County Commissioners.

The Land Development Regulations also require that solid waste management plans be completed before any proposed development of a Major Conditional Use is reviewed by the Planning Department. Solid waste generation rates and capacity assessments must be submitted for review and coordination with the Department of Environmental Management (DEM), formerly the Municipal Service District (Section 9.5-(a)(2)b(iv)).

In addition to providing solid waste facility capacity, the County has responsibilities for hazardous waste monitoring. Each Florida county must complete a hazardous waste management assessment, then must maintain an inventory of each small quantity generator, the types and quantities of waste they generate, and their hazardous waste management practices. The County must verify the management practices of at least twenty percent of the small quantity generators each year (Chapter 403.726, F.S.). Local governments are also required to participate in the DER administered "amnesty days," in which small quantities of hazardous waste may be dropped off for disposal free of charge. Finally, local governments can establish local hazardous waste collection centers with DER approval.

9.3 Solid Waste Generation

9.3.1 Land Uses Served By DEM Facilities

The predominant land uses in unincorporated Monroe County that are served by the DEM are residential, commercial, and governmental and institutional areas. Commercial facilities include numerous hotels, motels and marinas that provide accommodations to the seasonal population and tourists, as well as fish houses, marinas and boat yards that serve the commercial fishing industry. With one exception, the governmental and institutional uses that exist in Monroe County are also served by DEM. The military facilities at Boca Chica are served by the City of Key West's solid waste facilities on Stock Island.

The types of land uses served by DEM is a significant factor in the amount of solid waste generated. Table 9.1 depicts the solid waste generation in the DEM service area by the type of generator for the year October 1, 1990 to September 30, 1991. Forty-six percent of the total of 73,252 tons of municipal solid waste processed by Monroe County was generated by single family residences and eleven percent by multi-family complexes during this time period. Therefore, approximately fifty-seven percent of the municipal solid waste stream in the DEM service area is generated by residential areas. The remainder is generated by the commercial sector (forty-three percent). This figure includes governmental and institutional generators.

9.3.2 Historical Solid Waste Generation

At the present time (1991), Monroe County provides solid waste service to accommodate 52,718 permanent and 32,088 seasonal residents. The number of seasonal residents is defined as the average number of seasonal residents in the unincorporated county on a yearly basis. This 1990 population base reflects an historical increase in population and corresponding solid waste generation rates dating back to 1960. Interesting to note, however, is a recent decrease (since 1988) in the volume of solid waste generated in Monroe County. Table 9.2 summarizes historical solid waste generation for the service area.

Table 9.1
Municipal Solid Waste Composition By Type of Generator

Generator	Tons Per Year	Percent of Total Tons Per Year	Pounds per Capita per Day	Pounds per Capita Year
Residential: multi-family	8,037	11%	0.52	189.54
Residential: single-family	33,390	46%	2.15	787.44
Commercial	31,825	43%	2.06	750.54
Total	73,252	100%	4.73	1,727.52

Notes: 1) This table reflects tonnages delivered to the County's transfer stations and processed through the DEM system.

2) The residential single-family category includes mobile homes.

3) Per capita figures are based on the 1991 total (permanent + average seasonal) population of 84,806. Tonnages are DEM figures.

4) Data are for one year, October 1, 1990 to September 30, 1991.

Source: Monroe County Division of Environmental Management, 1992.

As seen in Table 9.2, solid waste generation in Monroe County has not increased steadily each year, but has shown a general increase over time. Although solid waste generation is expected to increase as

the population increases, the solid waste tonnage generated in the County remained level between 1983 and 1985, and actually declined from 1988 to 1989. According to actual tonnage reports, DEM's total tonnage in 1989 was about nine percent less than the total tonnage in 1988.

There are many factors that may have contributed to these periods of level and decreased generation. The declines may reflect the diligent efforts by the citizens of Monroe County to reduce the amount of solid waste they generate, through recycling, composting, mulching or other means. Other factors which are less easily quantifiable could also affect solid waste generation. The amount of construction taking place in the County, and thus the amount of construction debris being disposed of, also significantly affects the total amount of solid waste generated. Periods with less construction could have contributed to the decline in total waste generation. Finally, the weather affects the rate of vegetative growth, and therefore affects the amount of yard waste generated. Drier years could result in less total waste generation.

Table 9.2
Historical Solid Waste Generation for the DEM Service Area in Tons per Fiscal Year (excluding Key West)

Fiscal Year	DEM Total
1981	60,079
1982	62,415
1983	73,876
1984	72,635
1985	73,413
1986	82,705
1987	91,493
1988	99,508
1989	88,137
1990	83,342
1991	73,252

Note: The County Fiscal Year is October 1 to September 30.

These are scale tonnages. The amount of solid waste actually generated in the service area is greater (see Table 9.3).

Source: Monroe County Division of Environmetal Management, 1992.

9.3.3 Municipal Solid Waste Composition by Type of Material

The solid waste generated in Monroe County is comprised of a variety of materials. The tonnage and per capita generation figures for each waste material generated in the DEM service area are shown in Table 9.3. Yard waste, Paper products, and construction debris comprise the three largest components of the solid waste stream. Of these, yard waste is by far the largest component, with over 27,000 tons generated between October 1, 1990 and September 30, 1991. This constitutes 34% of the total 81,896 tons of waste generated in the DEM service area. Paper products, including corrugated material, comprise 18.4% of the solid waste stream, and construction and demolition debris total 11.1%.

As seen in this breakdown, the potential for recycling is high. The recyclable materials, paper products, yard waste, wood (a portion of construction and demolition debris), plastics, ferrous materials, aluminum, and glass comprise a total of approximately sixty-five percent of the County solid waste stream.

Table 9.3
Municipal Solid Waste Composition By Type of Generator

Materials	Tons per Year	Percent of Total Tons per Year	Pounds per Capita per Day	Pounds per Capita Year
Newspapers	2,539	3.1	0.16	59.88
Glass	5,487	6.7	0.35	129.40
Aluminum Cans	1,638	2.0	0.11	38.63
Plastics	5,078	6.2	0.33	119.80
Construction & Demolition debris	9,090	11.1	0.59	214.40
Yard Waste	27,861	34.0	1.80	657.10
White Goods	2,129	2.6	0.14	50.21
Tires	901	1.1	0.06	21.25
Ferrous metals	1,965	2.4	0.13	46.34
Non-ferrous metals	328	0.4	0.02	7.74
Paper: corrugated	483	5.9	0.31	114.00
Paper: other	10,239	12.5	0.66	241.40
Food Wastes	5,978	7.3	0.39	141.00
Textiles	1,474	1.8	0.10	34.76
Miscellaneous	2,359	2.9	0.15	55.63
Total	81,896	100%	5.29	1,931.40

Notes:

(1) Per capita figures are based on the 1991 total (permanent + average seasonal) population of 84,806.

(2) The tons per year figures are for the DEM service area (Monroe County excluding Key West.) They represent scale tonnages, plus materials recycled by private businesses and citizens. Therefore, this table should not be used as a comparison to Tables 9.2, 9.10, 9.11 and 9.12, and 9.13 for determination of capacity limitations and levels of service.

(3) Data are for one year, October 1, 1990 to September 30, 1991.

Source: Division of Environmental Management, 1992

9.4 Description Of Existing Facilities And Planned Improvements

9.4.1 Haul-Out Disposal Plan

Because of the limited remaining capacities of the three landfills, the maintenance and retrofitting necessary for existing volume reduction units, and the problems in expansion and siting landfills described above, Monroe County has recently contracted to have its solid waste hauled out of the County.

Prior to entering into the haul out contract with Waste Management Inc. (WMI), Monroe County was responsible for the collection and disposal of solid waste. The County's disposal methods consisted of incineration and landfilling at sites on Key Largo, Long Key and Cudjoe Key. Combustible materials were either incinerated or burned in an air curtain districtor. The resulting ash was used as cover material in the landfill. Non-combustible material were deposited directly in the landfill.

As a result of the haul out contract with WMI to transport the solid waste to WMI's landfill in Broward County, the County's incinerators and landfills are no longer in operation. Table 9.4 summarizes the status of the County's landfill and incinerators.

Table 9.4
Status of County Landfill & Incinerators

Site	Incinerators	Landfills	Reserve Capacity (cubic yards)
Key Largo	Closed 12/31/90	Under Closure Procedures	N/A
Long Key	Closed 1/7/91	Under Closure Procedures	N/A
Cudjoe - Old Site - Expansion	 Closed 2/25/91 N/A	 Under Closure Procedures For Emergency Use Only	

Source: Monroe County Department of Environmental Management, 1991

In December 1990 Waste Management, Inc. (WMI) began to haul wet garbage, yard waste and construction debris out of the county. The County will pay annual disposal fees for a guaranteed annual minimum of 75,000 and maximum of 95,000 tons of municipal solid waste. The County, in turn, has a guarantee that WMI will haul out and landfill the 75,000 tons per year generated in the DEM service area over the length of the five year contract. This 75,000 ton rate reflects the total municipal solid waste generated in the county, minus the volume of waste projected to be recycled. The initial haul out rate is $59.00 per ton. The waste will be hauled to a landfill operated by WMI in Pompano Beach in Broward County. By the last year of the contract the County will be paying $90 per ton, or $6,750,000 for the year for the haul out. This compares to the $38 per ton, or $2,850,000 per annum cost of disposal using the County's incinerators and landfills in the 1990 fiscal year.

Solid waste will continue to be collected by franchise and taken to the three landfill sites, which will serve as transfer facilities. At the transfer stations the waste will be compacted and loaded on WMI trucks for haul out. Recyclable materials, particularly white goods, tires, glass, aluminum, plastic bottles and newspaper have been excluded from the solid waste haul out contract. Recyclable materials will continue to be separated from the solid waste stream to the maximum extent possible. DEM will handle the marketing of recyclable paper, aluminum, glass and plastic, in addition to white goods, tires and batteries.

As a result of the haul out contract DEM staff will be reduced to only those necessary for closure, recycling drop-off sites and administration. Closure staff must assist with the recycling rolloffs and the processing of special wastes at the transfer stations.

9.4.2 Solid Waste Management and Disposal: 1996 to 2010

The County's current solid waste haul out contract will expire in May of 1996. Although the current contract includes an option for extension, the County is considering other options.

In 1992 the County advertised a Request for Proposals for long-term solid waste processing and disposal technologies. The response period for the RFP closed in July 1992. Seven proposals were received, including one from the County's current waste hauler. The Solid Waste Task Force, a citizen's advisory committee, has begun their review of the proposals. Once the Task Force has made a recommendation, the Board of County Commissioners will review the proposals and select the proposal which will best meet the County's long term solid waste management needs. The final selection is anticipated in early 1993.

Until the final selection is made, it is not possible to address the County's long-term solid waste management plans in any detail. It is possible, however, to summarize the County's intentions about acceptable processing and disposal methods, resource recovery and recycling, and environmental concerns from the proposals now being considered. Likewise, some preliminary estimates of the facility capacities and costs can be surmised from the proposals.

General RFP Requirements
All seven proposals include a technical document, a business report, a qualifications report and an executive summary. In the selection process, the proposals will be assessed for technical and financial feasibility, efficiency, management proposals, longevity, and for the potential impact on environmental resources.

Each proposal addresses both recycling and general solid waste processing and disposal, and details the new and/or upgraded facilities that would be needed to handle at least 250 tons per day of solid waste for the next twenty years.

Recycling/Resource Recovery Method
All of the proposals include some method to separate recyclables such as aluminum, paper, plastics, ferrous metals, corrugated cardboard and glass at the solid waste facility. The proposed recycling methods vary. One proposal would require that mixed recyclables be separated from the general waste by each household, and collected separately from the general waste. Others propose a "blue bag" system in which customers would leave their recyclables in a distinctive blue bag at their curbside. These bags would be collected at the same time as the other waste by the same hauler. The bags could then be separated more easily from other waste when it reaches the facility. At the

opposite extreme, a few proposals would not require source-separation, but would separate all recyclables at the facility through a series of manual and mechanical processes.

Solid Waste Processing Method
None of the proposals involve incineration of waste. All include some kind of composting. This would eliminate the necessity of a separate yard waste pickup. One proposal includes an option for the production of Refuse Derived Fuel, through pelletization, at the same facility as the composting & waste separation. The majority of the proposals would involve co-composting of solid wastes with septage & sludge produced in the county.

The type of compost that would be produced varies, as does the method of composting. The method for processing varies from windrows which are periodically turned, to forced-air, agitated concrete bays or tunnels. This processing step extends over a period of weeks. The proposals vary between a 3 to 12 week retention time. Most proposals also specify an additional "curing" step as well, during which the compost dries.

Some methods shred and grind inorganic particles into all or part of the compost. This would reduce the amount of residuals which would have to be landfilled, but would produce a lower quality compost. Other proposed methods, with no shredding or grinding, would result in a 100% biodegradable compost, but would leave a higher percentage of "non processable" waste to be landfilled.

Facility Capacity
Although all of the proposals intent to process at least an average of 250 tons per day (tpd) of municipal solid waste (msw), the tons per year (tpy) anticipated to be processed varies depending on the number of days and hours considered normal operation. The tpy estimates range from 62,500 to 98,000 for the 250 tpd facilities. These facilities would also use at least 25 tpd of septage & sludge. The smallest of these facilities estimates a production of 4000 tpy recyclables and 18,000 tpy (120 tpd) compost. The largest facility proposed would process an average of 500 tpd msw, or 156,000 tpy maximum. It would produce an estimated 30.8 tpd of residuals to be landfilled and 145.7 tpd of compost.

Finally, the proposal to haul out all of the County's waste to recycling and compost facilities in other counties provided no facility capacities, but would guarantee to process all of the solid waste that Monroe County generates.

Septage/Sludge Treatment Facility
Six of seven proposals would use septage/sludge produced in the county in its composting process. Most of these assume that this sludge will first be treated at a new County facility. However, one specifies that it uses untreated liquid waste in its compost, and no wastewater treatment plant would be necessary. Another proposes to construct a 12,000 gpd wastewater and sludge treatment facility as part of its package. A third proposes to use sewage sludge & septage from the County as well as from the Key West treatment plant in its composting process.

Location of Solid Waste Facilities
Six of the seven proposals would require the construction of a new solid waste facility at Crawl Key. The County purchased Crawl Key for this purpose in late 1990, and included a deed restriction that prohibits landfills or incineration on the site. One of these six proposals suggests a new compost staging area at Crawl Key, and the construction of a new Materials Recycling Facility and Volume Reduction Station at the site of the Long Key Transfer Station. An alternative option from one

company is the construction of three co-composting facilities, one at each of the existing transfer stations.

The only proposal that would not utilize Crawl Key proposes to truck all waste out of the county, to be separated at an existing recycling facility in Miami. The non-recyclables would then be hauled to a new composting facility in Broward County, which is scheduled to open in July 1993. This proposal would require upgrades to the 3 current waste transfer stations in the county, but would not require the construction of new solid waste processing facilities within Monroe County.

Diversion of Waste
All of the proposals would greatly reduce the amount of waste that would need to be landfilled. Both recycling and composting are considered to meet the state's resource recovery requirements. In all cases, the processes would by far exceed the state's minimum standards for diversion. All of the proposals estimate at least a 67% diversion of solid waste from landfill disposal.

Each method anticipates that some residuals will not be acceptable for either recycling or composting. Items such as white goods, wood, textiles and concrete would most likely need to be landfilled. One proposal, however, suggests that there is a market for some of the inert materials. It proposes to shred and grind some of the materials that are inappropriate for compost into an "aggregate" of small, inorganic particles that can be used for construction.

Marketing of Recyclables
The processing methods described above would yield traditional recyclables, such as aluminum cans and glass, plus compost that would have to be marketed and sold. Compost can be mixed in a variety of ways to yield products for many purposes, including greenhouse growing, golf course construction & maintenance, highway construction & maintenance, strip mining reclamation, and general agriculture.

All of the proposals include a market analysis. Some companies have established markets for their compost products and market on a nationwide level, while others have made inquiries in the Southeast Florida region and propose to establish markets within the region. In most of the proposals, the company accepts the responsibility of marketing, selling and transporting these products.

Some proposals anticipate a revenue from compost, while others assume a 0 or negative value. One company offers to split any revenues from recyclables at a 50/50 ratio with the County.

Disposal of Residuals
The estimations of residuals to be landfilled range from approximately 10% to 33% of the County's solid waste stream. The disposal methods proposed vary. The proposals range from County responsibility for transportation and disposal of residuals, to company responsibility for haul out and disposal out-of-county..

Environmental Considerations
All of the proposals include methods to minimize the detrimental effects of the facility on the surrounding community and the adjacent natural resources. Each would process the compost indoors, and would use odor and pollution controlling devices to minimize the impacts of the facility on the environment. Odor controlling techniques range from a biofilter through which air from inside the facility would be pumped, to biodegradable chemical spraying. Several propose to reuse leachate in the composting process. One specifies that a lined stormwater retention pond would be constructed, and others commit to retaining stormwater on-site. For hazardous wastes, most

proposals state that they will not be accepted at the facilities, but that a procedure will be put in place to separate out and handle incidental hazardous wastes. In addition, the use of wastewater and sludge in the composting process should minimize the amount of water that must be provided by FKAA, thereby conserving potable water supplies.

Facility, Maintenance & Operating Costs
Since the services offered in the proposals varies widely, it is difficult estimate the costs of the entire solid waste process at this point. For facility construction the cost estimates range from under $100,000 for upgraded transfer stations to almost $42 million for a fully-enclosed, 500 average tons per day co-composting facility. Annual operations and maintenance estimates are included in some proposals. They range from $2 million plus utilities to $3.5 million. Estimated tipping fees range from $44/ton to approximately $100/ton.

Start Up Time
The estimates for the length of time from a Notice to Proceed to the start-up of an operation depends on the method selected. If the County opts to upgrade its transfer stations and have the solid waste processed out-of-county, the start-up time is estimated at 6-8 months. If a new facility is to be constructed within the county, the estimates range from approximately 21 months to 44 months.

Financing and Management
The proposals are the most flexible in presenting their management and ownership options. Several leave the option open for the County to finance and own the facility while the company operates it, or for the company to own and operate the facility.

For two of the higher cost facilities, the companies propose tax exempt bond financing. The majority of companies suggest an initial per-ton tipping fee, adjustable periodically, and a guaranteed number of tons per year to offset operational costs. Some would charge a separate price per ton for wastewater. Most of the proposals include some type of cost-sharing between the County and the company. The County is asked to pay for disposal and transportation of the residuals, and/or for electricity, fuel and water in some cases.

RFP Conclusions
Within a short time, the County will select a recycling, processing and disposal method that will meet the County's solid waste management needs for the next twenty years. The County will consider both in-county and out-of-county processing and disposal, and will take into account the environmental impacts when selecting a proposal. Facility locations, capacities & costs, as well as funding mechanisms will be negotiated with the selected company.

9.4.3 Sludge, Septage and Leachate

The current County practice for sludge, septage and leachate treatment and disposal is removal by private contractors to an out-of-county location. This practice has been in effect since August of 1990 and the contract for these services extends through April of 1993. The County's proposed long-term solution for sludge, septage and possibly leachate treatment and disposal is the construction of facilities on Crawl Key at an approximately 40 acre site owned by the County at mile marker 56.5. In December 1991, DEM initiated a request for letters of interest and statements of qualifications to provide preliminary engineering, permitting, final design, construction, post construction and startup services for a sludge, septage, and/or leachate treatment disposal facility on Crawl Key. Selection of a consultant to undertake the design, permitting and implementation activities is expected to take place in

early 1992 and depending on the length of the permitting process the facility is expected to be completed within one to two years.

The scope of services for the implementation of a comprehensive sludge, septage, and/or leachate management program will include, but not be limited to, the following areas of service:

(a) Provide preliminary engineering and design services to include:

(1) The analysis of sludge and septage flows and leachate quantities in order to establish system design quantities and characteristics.

(2) Assistance in determining the land requirements for the Sludge and Septage Facility and in selecting the specific facility location on the Crawl Key site.

(3) Conducting a soils investigation on the selected treatment and/or disposal facility location to determine suitability of the soils and establish design criteria for the sludge, septage, and leachate treatment and effluent disposal system.

(4) Identifying the method of disposing of the treated effluent and residual solids and recommending the appropriate treatment processes.

(5) Conducting a treatability study to verify design criteria and expected performance. The treatability study will include at a minimum, jar testing of solids separation (including grease) in the septage, and bench scale activated sludge unit operation to establish bioflocculation capabilities and nitrification kinetics.

(6) Evaluating the ability to co-treat sludge, septage and leachate.

(7) Developing a preliminary design for the selected treatment and disposal alternative in sufficient detail for submittal of construction permit application(s) to the Florida Department of Environmental Regulation. The preliminary design will include:

(i) A process flow diagram.
(ii) A list of major unit processes with sizes, design criteria, design basis, and special construction materials.
(iii) A brief description of operation.
(iv) Preliminary layout drawings.
(v) Preliminary cost estimates.

(8) Identifying and evaluating potential project financing options.

(9) Reviewing existing County Ordinances as they relate to sludge, septage, and leachate management and making recommendations to the County regarding any necessary modifications.

(10) Evaluating the need for transfer station facilities including potential sites and economic feasibility.

(11) Submitting an assessment of the near shore environment at the Crawl Key site to serve as a record of general background conditions prior to any on-site construction.

(12) Preparing a preliminary design report that summarizes the completed engineering activities and submitted to the FDER with the construction permit application(s).

(b) Provide assistance to the County in procuring the necessary permits inclusive of any needed mitigation.

(c) Provide final design services to include:

(1) Preparation of the final design, construction drawings, and technical specifications for the proposed facility.

(2) Preparation of documents related to bidding and construction contracts.

(3) Preparation of engineer's estimate of construction cost based on the final drawings and specifications.

(4) Submittal of partial and final completion documents for the County's review. The original documents will be owned by the County.

(d) Provide assistance relating to bidding of reconstruction contracts to include:

(1) Issuing of addenda as appropriate to interpret, clarify or expand the bidding documents.

(2) Assisting the County in bid evaluation.

(e) Provide construction phase services to include:

(1) Review of shop drawing submitted by Contractor to assure compliance with design concepts.

(2) Oversight of construction activities to observe and report on progress and quality of executed work.

(3) Issue interpretations and clarifications of contract documents, prepare change orders, and make recommendations as to acceptability of work.

(4) Final inspection and report to County upon completion.

(f) Provide post construction and start up services to include:

(1) Preparation of an Operation and Maintenance Manual.

(2) Assistance in equipment modifications, identify deficiencies and obtain corrections, as necessary.

(3) Preparation of operating permit applications.

9.4.4 Disposal of Hazardous Waste

The management and disposal of hazardous waste has been a major national issue for more than a decade. In 1976, the U.S. Environmental Protection Agency (EPA) was directed to develop a national program to regulate and manage hazardous waste and to provide incentive for states to adopt consistent programs under the Resource Conservation and recovery Act. EPA is also authorized to respond to incidents requiring state cleanup and emergency mitigation. Funding for this purpose under the Comprehensive Emergency Response and Compensation Liability Act of 1980 is commonly referred to as the "Superfund" program.

9.4.5 State Legislation

In 1983, the Florida Legislature recognized the need to establish a coordinated and broad-based approach towards maintenance and improvement of the state's valuable and vulnerable water resources. The response was passage of a critical piece of environmental legislation entitled the Water Quality Assurance Act of 1983. One major component of the effort was that section specifically addressing hazardous waste. In preceding years, many sites in Florida where improper storage, treatment or disposal of hazardous waste had caused contamination of the ground water were uncovered. Consequently, Part IV of the Act addresses the critical role of hazardous waste as a potential groundwater contaminant.

This section of the law, contained in Chapter 403 of the Florida Statutes, established the framework for dealing with hazardous waste on the local level. It strictly prohibits the landfilling or disposal of hazardous waste to the ground anywhere in the State of Florida (Section 403.7222 F.S.). Furthermore, it requires two important actions of local government that continue to serve as a focus for local government activities concerning hazardous waste. First, section 25 (403.7225 F.S.) mandates the implementation of local hazardous waste management assessment. The first component of this assessment consists of a survey of business establishment hazardous waste generators, an inventory of the type and quantity of the hazardous waste generated, and a listing of the current practices used by these generators to treat, store or dispose of this waste. Second, the statute requires that each county designate areas within the county at which a hazardous waste storage facility could be constructed to meet a demonstrated need.

9.4.6 Large Quantity Generators

Large quantity generators are those generators which produce more than 1000 kilograms (kg) of hazardous waste in a calendar month. The only large quantity generators in Monroe County are public facilities or the military: the Florida Keys Electric Cooperative, City Electric, the Florida Keys Aqueduct Authority, the Navy and the Coast Guard. All of these generators are required follow requirements that are monitored directly by the Florida Department of Environmental Regulation.

9.4.7 Small Quantity Generators

Small quantity generators are those which produce between 100 and 1000 kg per calendar month. The amount of material produced determines the regulations which must be followed. As a part of responsible management, the generator is required to maintain a record of the accumulation, amount, type and number of containers of waste. The generator must also have a Preparedness and Prevention Plan which sets procedures for managing the waste within the generator's business, including safety precautions and emergency plans should an accident occur. The generator is required to obtain an EPA/DER identification number and must contract with a licensed transporter.

Monroe County is responsible for monitoring small quantity generators. This program is managed by the DEM. There are approximately 800 potential small quantity generators that are registered in the County. On this list, all small quantity generators are termed "potential" because the definition of a generator is given in terms of how much waste is produced each month. Small businesses may produce hazardous waste one month but not the next. The businesses are not considered actual small quantity generators unless they have produced hazardous waste in a given month.

Businesses that produce a very small amount of waste in a given month are "conditionally exempt." This means that they do not have to follow manifestation procedures, but must still comply with storage requirements. Small quantity generators must have a "cradle to grave" manifestation, as required by DER and the EPA, documenting every stage of their waste disposal process. The DEM is required to inspect 20% of the 800 sites each year. DER also performs spot checks of generators.

9.4.8 Storage

The DER regulations specify on-site storage facilities and labeling requirements for small quantity generators. The Monroe County DEM monitors this through inspections. There are no building code requirements for small quantity generators. Only the containers and tanks are regulated.

9.4.9 Transportation and Disposal

Each small quantity generator is responsible for the transportation and disposal of its own hazardous waste. However, as part of the agreement with the County, small quantity generators can contract with the County's private contractor, Laidlaw, at reduced rates. A generator can choose its own transportation company as well, as long as the company is licensed by the State. The generator of the waste and the transporter are both responsible for any mishaps; the "cradle to grave" manifestation must document every step. Transportation of hazardous materials within public right of ways also falls under the jurisdiction of the Department of Transportation.

There are no hazardous waste disposal sites in Florida. Disposal sites are scattered throughout the South, each accepting only certain types of wastes. Cost for transportation and disposal for the small quantity generators and the County depends on not only the quantity of waste, but also on the type and how far it must be transported.

9.4.10 Household Hazardous Wastes

DEM has two temporary storage facilities, at Cudjoe and Long Key, to store small quantities of primarily household hazardous wastes. DEM goes out for bid for the transportation and disposal of this waste. At present, the County has a two year contract with GSX Laidlaw. The County accepts small quantities of hazardous wastes at the storage facilities and also runs "Amnesty Days," where small quantities can be dropped off for free. In addition, the County has encouraged auto repair stations to voluntarily collect batteries and waste oil from their customers as a public service.

9.4.11 Contaminated Sites

Property owners are required to clean up any contaminated sites on their property. There are five properties in Monroe County listed on EPA's CERCLIS inventory of potential hazardous waste sites. Many, if not all of these are SUPERFUND sites. There are at least 10 specific contaminated sites; most are old Army or Navy sites. The Navy has commissioned several studies to begin the cleanup. They received SUPERFUND money for these analyses. No cleanup has started on any of the sites. The Navy will probably have to apply for more SUPERFUND money to undertake the actual cleanup. DEM also suspects there are some contaminated sites on civilian property but these would fall under the jurisdiction of DER.

Monroe County's Hazardous Waste Assessments, Identification of Abandoned Dump Sites (n.d.), lists additional sites which have the potential to be contaminated. The report lists the potential hazardous waste problem for these sites as minimal for all sites except one in Key West, for which the potential was unknown. No documentation is given that justifies the "minimal" determination. Abandoned dump sites are under DER jurisdiction. The list of abandoned dump sites are presented in Table 9.5.

Table 9.5
Unincorporated Monroe County Dump Sites

Site	Sec/Tws/Rng	MM	Owner	Type	Potential Hazardous Waste Adden
Boca Chica	5/68/26	8	U.S. Government	Landfill	Minimal (Inactive)
Saddle Bunch Key	8/67/27	15	U.S. Government	Landfill	Minimal (Inactive)
Middle Torch Key	17/66/27	27	Baltuff	Landfill	Minimal (Inactive)
Boot Key	16/66/32	48	Tropic South Inc.	Landfill	Minimal (Inactive)
Key Largo	9/60/40	NA	Carter	Landfill	Minimal (Inactive)
Cudjoe Key	20/66/28	21	DEM	Landfill/ Incinerator	Minimal (Inactive)
Key Largo	11/60/40	NA	DEM	Landfill/ Incinerator	Minimal (Inactive)
Long Key	27/65/35	68	DEM	Landfill/ Incinerator	Minimal (Inactive)

Source: Division of Environmental Management

Another cause of soil and groundwater contamination is storage tanks. The Florida Department of Health and Rehabilitative Services (HRS) is in charge of inspections for tanks containing vehicular fuel and pollutants. DER handles tanks containing hazardous substances. HRS estimates that 99% of the active tanks in the County are reported to HRS. Potential abandoned tanks may present a great health and safety hazard. HRS relies upon citizen reports of tanks, and upon the Tank Inspector finding abandoned tanks while on field inspections.

9.4.12 Emergency Management

A federal Community Right-To-Know law, managed by the EPA with some authority delegated to the States, requires that companies using hazardous substances register with state and local authorities. Any projects producing hazardous waste are required to inform the Fire Department, the Police, and the hospitals.

Through the Florida Department of Labor and Employment Security, Division of Safety and OSHA, Florida's Right-To-Know law is enforced. Employers must inform their employees about any toxic substances in the workplace. Workers can refuse to work with substances if they are not provided a Material Safety Data Sheet on the substance by their employees.

9.4.13 Public Education and Training

DEM offers training sessions and classes on hazardous waste management to various business and community groups. Training, along with evaluation and assessment, is one of the topics on which The Cooperative Extension Service has written materials, slides, and a video that are available upon request. The County also participates in and promotes Amnesty Days.

DEM's involvement with actual hazardous waste disposal is limited. DEM completes surveys required by the state and federal governments, and inspects the sites of suspected hazardous waste generators when reports of improper disposal are received. DEM also disseminates information on proper disposal methods to hazardous waste generators. Each year DEM also verifies the hazardous waste management practices of at least twenty percent of its inventory of small quantity hazardous waste generators, as required by law.

9.5 Public and Private Solid Waste Facilities

9.5.1 Solid Waste Collection

The collection of solid waste is undertaken by private contractors under franchise agreements with Monroe County. The following private solid waste collection contractors presently operating under franchise agreements with Monroe County are shown in Table 9.6.

Table 9.6
Solid Waste Collection Contractors

Collection Company	Franchise Area
Baltuff Disposal Service Inc.(1)	Ramrod Key north to Seven Mile Bridge
Bland Disposal Service Inc.	Key West north to Ramrod Key
Florida Disposal Company	Stock Island (west of Cross St. north of 9th Avenue)
Island Disposal Co. Inc.	Snake Creek Bridge to Long Key Bridge
Key Sanitary Service	Snake Creek north to Dade County Line
Marathon Garbage Service	Pigeon Key north to Long Key Bridge
Ocean Reef Solid Waste Inc.	Ocean Reef Club

(1) At the present time the Monroe County DEM is undertaking procedures to become the entity responsible for collection of solid waste between Ramrod Key and the Seven Mile Bridge.

Source: Monroe County Division of Environmental Management, 1991

9.5.2 Transfer Facilities

Through the terms of the five year contract between the Monroe County Board of County Commissioners and WMI, a lease agreement which runs concurrent with the solid waste haul out contract allows for the utilization of the County owned transfer stations by WMI. The location of the transfer facilities are depicted on the Solid Waste Map series of the Map Atlas. The size and capacity of these facilities are shown in Table 9.7.

Table 9.7
Solid Waste Transfer Facility Sizes and Capacities

Transfer Facility	Acreage	Capacity
Cudjoe Key Transfer Station	20.2 acres	200 tons/day
Long Key Transfer Station	29.5 acres	400 tons/day
Key Largo Transfer Station	15.0 acres	200 tons/day

Source: Waste Management Inc., 1991

The maintenance and operation of the solid waste transfer facilities is entirely the responsibility of WMI. These responsibilities include enforcement of safety procedures, ongoing repair and maintenance of facility components, assurance of compliance with all applicable federal, state and local laws, regulations and permits including those pertaining to the environment and OSHA, and prevention of any environmental degradation to the transfer sites. The contract only allows for the receipt of "acceptable waste" which is defined as not being Hazardous, Biohazardous or Atomic Waste. The disposal of unacceptable waste is the responsibility of the generator and must be accomplished through the use of licensed private waste removal firms. The County can, upon 12 hours notice, perform inspections to determine compliance with the operational terms of transfer station lease agreement.

9.5.3 Landfill and Resource Recovery Facilities

A. Landfill Facility

The ultimate solid waste disposal site stipulated in the haul out contract is the WMI owned and operated Central Disposal Sanitary Landfill (CDSL) located at 3000 Northwest 48th Street, Pompano Beach (Unincorporated Broward County), Florida. The CDSL is a combination Class I and Class III landfill. The landfill is a lined facility and relies on the "high rise" method of waste disposal, with successive layers of debris and soil laid down to accommodate continued demand. The CDSL site, which totals approximately 600 acres, consists of three sections or cells, a buffer area, an administration and maintenance area, and a water management area. The design capacity of the CDSL is shown in Table 9.8.

Table 9.8
Central Disposal Sanitary Landfill Capacity

Facility	Design Capacity
Site I (closed 1988)	9,250,000 tons
Site II (1)	3,425,000 tons
Site III	6,150,000 tons
Monofill	3,200,000 tons

(1) The capacity of Site II will be extended to approximately 8,000,000 tons when the Florida Power and Light transmission lines are rerouted.

Source: Broward County Comprehensive Plan, 1989

WMI has indicated that the remaining capacity at the Central Disposal Sanitary Landfill is 34,866,400 cubic yards which equate to a 32 year life expectancy. Monroe County has been allocated 20% of the landfill volume for the remaining four years of the haul out contract. On a daily basis this allocation is 250 tons per day or 360 cubic yards per day. WMI has indicated that at the present day incoming tonnage, 28,127,400 cubic yards of capacity will be available in the year 2010 and that a haul out contract extension would guarantee the necessary capacity to serve the County. Although these figures were obtained after Hurricane Andrew struck South Florida on August 24, 1992, the full effects of the hurricane on the landfill's remaining capacity and life expectancy are unknown.

B. Resource Recovery

Resource recovery is the process of recovering materials or energy from solid waste. Mandatory or voluntary recycling of common waste products like newspapers and aluminum cans has become an increasingly popular means of recovering materials while reducing the volume of waste that is landfilled. A less common method of resource recovery turns wastes into heat and energy through incineration or other means, such as the Key West Waste-to-Energy plant.

Resource recovery in Broward County (North Broward at the North Regional Resource Recovery Facility and South Broward at the South Regional Resource Recovery Facility) is accomplished through two 2,250 ton/day, 70 megawatt trash to energy facilities designed, built, owned and operated by Wheelabrator Technologies (see Table 9.9). WMI utilizes the North Regional Resource Recovery Facility. Each facility is designed so its daily capacity can be expanded to 3,000 tons to meet future needs. Florida Power and Light Company purchases the electricity generated by the facilities. To provide for the disposal of ash from the resource recovery facilities, Wheelabrator has designed and constructed a state-of-the-art monofill with a liner system that includes structural fill, a six inch layer of bedding sand, a manufactured clay liner, two high-density polyethylene liners, a 24 inch layer of drainage sand and leachate collection systems. With the operation of these two facilities the expected life of the CDSL is extended approximately 20 years.

Table 9.9
Disposal Facility Demand and Capacity Comparison

Disposal Facility	Current Demand	Design Capacity
CDSL	950 TPD	7,490,815 (tons)
NRRF	250 TPD (ash)	3,200,000 (tons)
NRRF	700 TPD	2,250 TPD
SRRF	2,000 TPD	2,250 TPD

Source: Broward County Comprehensive Plan, 1989

9.6 Recycling Program

The Monroe County Recycling Program was initiated in September 1989. Initial activities included the purchase of four multi-material recycling containers and the establishment of Neighborhood Recycling Centers as recycling drop off sites. Since that time, eleven additional sites have been established and ten new sites are anticipated to be established in the next year. Two areas of Monroe County established curbside collection during 1991. The city of Key West and the Middle Keys area, including Marathon, have curbside collection for 18,000 residential units including both single and multi-family residential units.

Recycling programs related to commercial establishments have been developed and put in place. The Monroe County School District has developed and implemented programs at all county schools and county, state and federal agencies have started recycling materials including yard waste. New commercial developments are required to submit a study to show how waste will be reduced and recycled from clearing through on-going operation. A small Materials Recycling Facility (MRF) has been established by the Recycling Program and is operated by county staff; materials are processed, shipped and marketed from this facility, which is located in Marathon. County staff has been supplemented in 1991 by the addition of non-profit groups, volunteers, senior citizen and youth programs and prisoners who aide in curbside collection of materials handling and site operations.

The Monroe County Solid Waste Recycling Program requires a high degree of flexibility to meet both the needs of the communities it serves, while maintaining an aggressive and positive approach. Flexibility has been needed because these first programs in the Florida Keys have been used to test the actual potential of different types of solid waste reduction through recycling.

As indicated, in July 1990 the Monroe County Commissioners took action to contract for the hauling out of solid waste. A contract was signed with WMI for that purpose. Under the terms and conditions of the Solid Waste Haul Out contract with WMI, solid waste is collected by franchisees and taken to the three trash transfer facilities. At these facilities the solid waste is transferred to trucks for hauling out of Monroe County. The solid waste hauled out of the County includes non-recyclable materials with the

exception of yard waste. Recyclable materials, particularly glass, aluminum, plastic and newspaper have been excluded from the solid waste haul out contract. Recyclable materials are being and will continue to be separated from the solid waste stream to the maximum extent possible at the source.

In April 1991, a yard waste mulch program was initiated. WMI takes separate loads of yard waste to be mulched through a tubgrinder at the transfer station. It is anticipated that all three county transfer facilities will have tubgrinders on site. A target date of January 1, 1992 has been set to begin separate curbside collection of yard waste in Monroe County. A minimum of thirty (30) percent reduction of the solid waste stream through recycling has been established as the recycling goal for the County.

The current and anticipated recycling and public education projects in Monroe County are described in Sections 9.6.1 to 9.6.7.

9.6.1 Voluntary Recycling

A. Residential

Curbside Collection

The Monroe County Recycling Department began providing curbside recycling for approximately 4,500 single family homes as a pilot program in December 1990. Twenty-six multi-family complexes are now participating in the Middle Keys pilot area. Based on the results of the pilot project, which will be studied for cost and participation, curbside collection may be extended throughout the County. Two trucks and household and multi-family containers purchased with DER grant funds are being utilized in the program. The education program for the residents included television advertisements, newspaper, radio and printed material. Two new areas for expansion of curbside recycling are being considered by the Recycling Department.

Drop Off Centers

Drop off centers have been made available to the residents as part of the Neighborhood Recycling Center Program. This program consists of fourteen sites situated throughout Monroe County. The ultimate goal is to establish one site on each Key. These sites currently collect aluminum, glass containers (all colors), HDPE and PET plastic (milk jugs, beverage bottles, and any containers commonly found under the sink), and newspapers. Several sites also collect cardboard and office paper. Three sites are used as distribution points for county mulch which is made from chipped yard waste. It is anticipated that ten additional sites will be established in the immediate future.

Master Recycler/Senior Recycler Program

Monroe County has a recycling program designed to offer residents a rebate on their solid waste removal bills in exchange for participating in recycling and compositing programs. Participants in the Master Recycler Program are required to compost all kitchen waste, (meat, fish and dairy products are optional) mulch yard waste and are limited to one garbage pick up per week. Participants in the Senior Recycler Program are required to compost and are limited to one garbage pickup per week. Both programs require separation of all recyclable materials from the trash either for pickup where available or drop off at designated County recycling centers. In exchange for participation in the Master Recycler Program an annual $100 rebate on participants' garbage collection bills is offered. Senior Recyclers receive an annual $50.00 rebate.

B. Commercial

The hospitality industry, including hotels, motels, guest houses, bars and restaurants, are also encouraged to establish recycling programs. Cardboard, glass, aluminum and office paper make up the largest components of the recyclable fraction of the hospitability industry. Lending institutions, hospitals, and other contributors of major amounts of white paper and computer paper have been encouraged to participate in recycling those materials. Recycling audits done on the premises have helped businesses to determine the amounts of materials with the potential to recycle. Commercial generators of all sizes have established programs to collect the various materials.

Collection of recyclable materials from commercial entities is conducted on individual sites and in Monroe County, recyclables are handled by individual businesses. Some businesses sort, collect and transport materials to county drop off sites, while others contract for services. There are several companies offering contractual services for recycling in the Florida Keys. The Monroe County Recycling Department anticipates offering commercial curbside recycling in one franchise area this year. The Business Recycling Workshops will continue to be undertaken.

9.6.2 Government Mandatory Recycling

A. Monroe County

Monroe County has implemented recycling programs at most county facilities. Materials collected include white paper, computer paper, aluminum cans, and cardboard.

A pilot program was initiated in August 1989 at the Stock Island Public Service Building which currently collects white paper, computer paper, newspaper and aluminum. The program has been expanded to other county facilities, including the Monroe County Courthouse Complex in Key West; the Marathon Government Center; and the Plantation Key Government Center, among others. The materials are currently picked up on an on call basis by the County Recycling Crew. A contract for pick-up, transporting and marketing services is being considered by the county as a cost saving alternative to county collection of materials.

B. Monroe County School Board

The Monroe County School Board has established recycling programs at all county school facilities and collects aluminum, white paper, computer paper, plastic, glass, and cardboard. A program for mulching of yard waste is also being incorporated.

In-service training for faculty and staff has been held at the School Board Office and in Marathon, at the County Library. Curriculum and recycling projects for teachers and students have been established by cooperative work with the Science Coordinator. The Monroe County School Board has in place a Solid Waste Reduction Plan.

Field Trips to recycling facilities have routinely been offered to classes and will be expanded to include solid waste facilities.

The Florida Keys Community College has designed and implemented a recycling program for office paper, aluminum, newspaper and cardboard. A compost demonstration project started by the College Grounds Keeper has become an integral component of waste reduction for the facility.

C. U.S. Military

The United States Military facilities located in Monroe County participate inrecycling programs at all facilities by collecting office and computer paper, cardboard, and aluminum which are currently being recycled at non-residential facilities. Curbside collection has been established for all military residential areas and includes collection of yard waste which is turned into mulch for use on military facilities.

9.6.3 Yard Waste Program

Yard waste comprises the largest percentage by weight and volume of the County's waste stream Three target areas have been established to reduce and recycle this significant component of the waste steam.

A. Monroe County

In September 1989 a plan to facilitate reduction of yard waste was established which consists of chippers established at four locations: the landfill at Long Key, two Neighborhood Recycling Centers, and the permanent Recycling and Collection Center in Marathon. Residents were encouraged to bring their yard waste to these locations to be chipped for use as mulch or incorporation into compost. Mulch was made available free to residents. The "Monroe County Moves Mulch" project began in April 1991 with distribution of mulch brought to the transfer stations in clean loads by waste haulers from bulk yard waste collections.

Monroe County has initiated the separate curbside collection of yard waste from the residential and commercial sectors. Yard waste is delivered to the three transfer stations where it is put through a tub grinder and ground into mulch. Storage, packaging and marketing of yard waste mulch as a product is under consideration and it is anticipated that a commercial or non-profit entity may be contracted to handle the material created from the yard waste.

B. Residential

A yard waste compost training program has been implemented to encourage both community composting and composting by individuals. The composting program is further described in Section 9.6.5. The County Extension Service in cooperation with the County Recycling Office has implemented this program and has conducted three yard waste compost workshops.

C. Commercial and Single Family Home Construction

A solid waste management plan for new construction has been developed and implemented to reduce waste from construction. Yard waste generated from clearing the site is chipped and used on site as mulch or ground cover or a contractor is hired to chip and haul the mulched yard waste to an alternate commercial site for use or sale as a marketable material. Construction debris can also be recycled in the County by a private company.

New construction must be coordinated with the Recycling Department prior to permitting and a Solid Waste/Management Plan is required to be submitted for review by the Recycling Department. Architectural plans are reviewed for inclusion of recycling areas and waste reduction geared to the premises. A waste reduction plan must be implemented for new developments.

9.6.4 Abandoned Vehicles

A program to remove, crush and haul abandoned vehicles for processing has been developed by Monroe County. This service is provided to the County through contractual agreement.

9.6.5 Education

A comprehensive program for public education and awareness has been developed and is being implemented for the entire County. The City of Key West, the City of Layton, and the City of Key Colony Beach are included by interlocal agreement.

Target areas for the education program include the public school system, civic groups, homeowners associations, condominium associations, professional associations, the hospitality industry, business entities, and government agencies, including the state parks and military facilities.

A. School System

Awareness and participation of children in recycling efforts is being promoted through activities including classroom and extra curricular events and collection competitions. A Recycling Education and Awareness program for grades K-12 is being developed to be taught throughout the school system. County staff will serve to assist, promote and coordinate educational activities for the public school system. Materials have been developed for use in the classroom which include puppet programs and video presentations. The recycling program developed by the Department of Education is being extensively used with each school in the District having a Recycling Coordinator.

B. Other Groups Targeted for Recycling Education Programs

Civic groups, homeowners associations, condominium associations, professional associations, the hospitality industry, business entities, and government agencies, including the state parks and military facilities have been targeted for recycling presentations and activities. A mailing list of approximately three hundred groups and organizations has been compiled. News releases have been sent to those groups detailing information on programs and upcoming events. Brochures have been developed for use by these groups. Other materials have been developed including flyers and newsletters.

Five 30 second commercials have been produced and shown on several television networks. Four videotapes have been produced to further enhance presentations. "Recycle Florida Keys," a video depicting the solid waste scenario and steps being taken implement the recycling program is 8 minutes in length. "Office Paper Recycling" demonstrates implementation of an office paper recycling program for businesses. "Curbside Recycling," "Bags, Bundles and Bins," and "How to take out the garbage in the Florida Keys," provide information on recycling and solid waste topics. Copies of these videos are distributed to schools, county libraries, county and city commissioners, county and city offices, organizations and businesses on request.

The Recycling Department co-produces a 30 minute weekly cable TV show called Project Earthbound. Two volunteers co-host the show which revolves around residential and commercial recycling. All business sponsors must have a working recycling program in place.

A newspaper insert promoting recycling is being prepared for insertion in local papers during the next year. Materials promoting commercial recycling are being prepared.

C. Government Agencies

Recycling presentations, activities and materials have been developed for use by all participating government agencies. Handouts describing the County office paper recycling program have been distributed to several state and city offices. The City of Key West has implemented a recycling program based on the county pilot program. Consultant services and site visits have been provided free of charge by the Recycling Department to state offices to help in design of recycling programs.

D. Public Relations

A list of all local newspapers, radio stations and television stations has been compiled. News releases and public service announcements are sent regularly to all local newspapers and radio stations. Paid advertisements have been utilized for publicizing special recycling events. Brochures have been prepared and distributed. Flyers on certain aspects of recycling have been developed with additional flyers being added each year. A newsletter may be started for distribution county wide in 1992. Television commercials and educational recycling videos have been and continue to be developed for use by local television media.

F. Yard Waste Compost

A program specifically developed to train people in the techniques of composting is being implemented in cooperation with the County Extension Service. A program has been designed to train citizens in composting. Trained citizens will be encouraged to carry out community composting projects and train other citizens in the techniques of composting.

9.6.6 State Mandated Waste Separation Deadlines

In addition to recycling of materials, as previously described, another way to reduce the demand for landfill space is to incorporate resource recovery and volume reduction practices into the solid waste disposal process. For this reason, and to reduce the hazard certain wastes may cause to humans and the

environment, the State has imposed a number of deadlines for the separation of special wastes from landfills. They are:

October 1, 1988:	No used oil accepted at landfills.
January 1, 1989:	No lead-acid batteries at landfills.
July 1, 1989:	Only shredded tires at landfills.
July 1, 1989:	All construction debris separated at landfills.
January 1, 1990:	No large appliances at landfills.
January 1, 1992:	Yard waste only accepted at specifically designated landfills.

The DEM has met each of these mandates, up through the 1990 deadline for large appliances. Yard waste is already separated from the solid waste to be landfilled.

A. Waste Oil

As of September 1990, waste oil was being accepted at the all three DEM solid waste facilities and at some service stations. The oil is collected in five hundred gallon storage tanks at the solid waste facilities, then emptied for a per gallon fee. This service has been provided since February 1989.

B. Lead Acid Batteries

Lead acid batteries have been segregated by DEM at all three landfills on an ongoing basis since before October 1988. They are removed by private enterprise at no charge to the District.

C. Tires

Tires are likewise segregated from landfill waste. As of October 1989, tires were being stockpiled at landfill sites, then deposited in a borrow pit at the Long Key Landfill after processing. The borrow pit spans 4-5 acres with a maximum depth of approximately 35 feet. As of December 1988, the filled volume was estimated at twenty percent of capacity. Currently DEM stockpiles tires at the Key Largo site, and contracts for a mobile tire shredder to cut the tires into 2" X 2" pieces. Tire pieces were used as part of the liner system in the landfill expansion at Cudjoe Key.

D. Construction and Demolition Debris

Construction and demolition debris is separated from other solid waste. Until January 1991 when WMI began hauling this material out of the County, a private company was grinding and storing the debris. The potential for recycling of this material is anticipated.

E. White Goods

White goods are collected by the franchised solid waste collectors, brought to the three solid waste facilities, and stockpiled. Monroe County has contracted with a private company to process, bale and ship white goods. Baled white goods are transported via flat bed trailer to a Tampa market. Consideration was given by the company to barge the metal bales to market, but no activity in this

regard is reported at present. The contract commenced in July 1988; between the contract start and September 1990 a total of 340.5 tons of metals were processed. While other counties are paid for their white goods, due to transportation costs DEM must pay its contractor twenty dollars per ton to process and haul them out of the county.

9.7 Geographic Service Area

DEM has divided solid waste collection operations within Monroe County into three subdistricts. These geographic boundaries of these subdistricts are shown on the Solid Waste map series of the map Atlas and are described below:

(a) Subdistrict I is served by the Key Largo Transfer Facility and comprises an area extending from the Dade County line to Snake Creek at southern Plantation Key. The collection franchises serving Subdistrict I are the Keys Sanitary Service, Island Disposal Co. Inc., and Ocean Reef Solid Waste Inc.

(b) Subdistrict II is served by the Long Key Transfer Facility and comprises an area extending from Snake Creek to the Seven Mile Bridge. The collection franchises servicing Subdistrict II are the Island Disposal Co. Inc. and Marathon Garbage Service.

(c) Subdistrict III is served by the Cudjoe Key Transfer Facility and comprises an area from the seven mile bridge to Stock Island (Incorporated Key West is not part of the WMI operation). The collection franchises serving Subdistrict III are the Baltuff Disposal Service Inc., Bland Disposal Service Inc. and Florida Disposal Co.

9.8 Level of Service Standard (LOS) Standards

Due to declining solid waste generation in the last three years 1989-1991, the LOS standard utilized for projecting solid waste demands during the planning periods was 5.44 lb/cap/day, the LOS for 1990. The generation from 1989 has continued to decline despite increases in population; and the LOS for 1991 reached a low of 4.73 lbs/cap/day. In order to be slightly conservative, the LOS figure for 1990 was used. This value is considered a reasonable standard because: 1) the solid waste generation rates have steadily declined in recent years; 2) the County has increased its recycling efforts; 3) the County plans to continue to increase its recycling efforts; and 4) the limitations on new development should reduce the amount of bulky construction debris generated. Table 9.10 depicts the historical solid waste generation for Monroe County exclusive of the City of Key West and more specifically defined as the service area for the Department of Environmental Management. Seasonal population is defined as the average daily seasonal population on a yearly basis. The following solid waste level of service standards are proposed:

(a) Collection Frequency:

Residential: twice weekly
Commercial: by contract

(b) Disposal Quantity:

Residential: 5.44 pounds per capita per day equaling 12.2 pounds per equivalent residentail unit (ERU) (based on 2.24 persons per household).

Total Capacity: 95,000 tons per year or 42,668 ERU's

Table 9.10
Solid Waste Generation Trends

	Solid Waste Generation	POPULATION			LOS
Year	(Tons/Yr)	Perm.	Seas.	Total	(LBS/CP/DAY
1986	82,705	45,763	29,476	75,239	6.02
1987	91,493	47,256	30,076	77,332	6.48
1988	99,508	48,797	30,687	79,484	6.86
1989	88,137	50,389	31,312	81,701	5.91
1990	83,342	52,032	31,949	83,981	5.44
1991	73,252	52,718	32,088	84,806	4.73

Source: Keith and Schnars, P.A., 1993

9.9 Projected Future Ability to Meet Level of Service Standards

Table 9.11 presents projected solid waste generation in unincorporated Monroe County from 1992 to 2010 based upon a LOS standard of 5.44 pounds per capita per day. The level of service includes white goods, tires, construction and demolition debris, and yard waste.

The current haul out contract with WMI is limited to 95,000 tons per year and excludes certain recyclable items. Currently white goods and tires are not being hauled out which represent 3.7% of the waste stream according to the study performed by DEM in 1989/1990 and an aggressive yard waste recycling program was initiated in April 1991 with curbside collecting beginning January 1992. Yard waste represents approximately 34% of the waste stream which presents tremendous potential for waste reduction. Construction debris and yard trash generated by site clearing should also be significantly reduced in the future as a result of the growth limitation of 255 units/year for the unincorporated county. These factors alone, without considering any additional recycling programs, should result in haul-out tonnages below the existing contract limitation of 95,000 tons per year.

Table 9.11
Projected Demands

	POPULATION			LOS	PROJ. SOLID WASTE GENERATION
YEAR	PERM.	SEAS.	TOTAL	(LOS/CAP/DAY)	(TONS)
1992	53,404	32,227	85,631	5.44	85,014
1995	55,895	32,817	88,712	5.44	88,073
1997	57,556	33,211	90,767	5.44	90,113
2002	59,653	33,711	93,364	5.44	92,692
2010	59,653	33,711	93,364	5.44	92,692

Notes:

1) Seasonal population refers to the number of average daily seasonal population on a yearly basis.
2) Generation includes the incorporated areas of Layton and Key Colony Beach.
3) The year 2010 utilized the same population data as the build out year 2002.
4) Projected Solid Waste Generation = Total Population X LOS

Source: Keith and Schnars, P.A., 1991, Revised 9/23/92 - LOS.

Table 9.12
Remaining Broward County,
Central Disposal Sanitary Landfill Capacity

Year	Remaining Capacity (cubic yards)	Allocation (cubic yards)	Demand (cubic yards)
1992	34,866,400	6,973,280	137,274
1995	33,743,200	6,748,640	126,825
2002	31,122,400	(2)	133,476
2010	(1) 28,127,400	(2)	133,476

Source: Waste Management, Inc., 1992

(1) Since no growth projections are available beyond the initial ten year planning period, the same demand has been utilized for 2010 as in the buildout year (2002).

(2) The allocation has not been guaranteed since it is beyond the WMI haul-out contract period.

Although the decline in total tonnage generated between 1988 and 1990 is encouraging, it is not practical to base solid waste management plans on a continually declining level of waste generation. Historically, absolute increase in population has resulted in a proportionate increase in the volume of solid waste generated. In determining existing and future needs, population projections must be considered to determine additional solid waste demands. During the planning period 1990-2010, population is expected to increase within all three solid waste service areas of the County.

9.10 Key Carrying Capacity Limitations, Facility Inadequacies and Policy Constraints

The latest data available from the DEM (September 3, 1991) indicates that 77,650 tons of solid waste will be processed in September 1991- September 1992 which compares favorably with the terms of the haul out agreement with WMI. Tables 9.12 and 9.13 represent the growth limitations within the unincorporated county based on the solid waste transfer facility capacity and the terms of the existing haul out contract respectively. In addition, WMI has projected, as of September 5, 1991, that the volume of solid waste generated will decline by approximately 8% over the next year as a result of the County's recycling efforts. Based on these preliminary projections, continuation of the contractual agreement with WMI will adequately address the solid waste disposal needs of Monroe County through the five year contract period ending December 1995. The WMI haul out contract contains provisions which allows for the automatic extension of the contract for five additional five year periods. The terms and conditions presently in effect would continue if the contract is renewed. Both Monroe County and WMI have the option of non-renewal.

Monroe County recognizes that time frames for implementation of a county-wide solid waste disposal program require a lead time which could be as long as the remainder of the WMI haul out contract. The DEM issued a Request for Proposals December 9, 1991 related to addressing the means for solid waste disposal as an option to continuation of a haul out solid waste disposal program. The selected consultant will provide preliminary engineering, permitting, final design, construction, post construction, and start-up services for a sludge, septage, and/or leachate treatment and disposal facility on Crawl Key. Procedurally, DEM, would, in conjunction with the already established Solid Waste Task Force, indicate the solid waste options to be addressed by respondents to the RFP. Preliminary indications are that haul out, incineration and mandatory separation of solid waste composting, pelletizing and sludge processing would be discussed during development of the RFP. Attaining the State mandate of 30% solid waste source reduction as well as recycling programs and sludge disposal will be included in the RFP. A definitive schedule related to the RFP and response process is expected to be received from DEM in mid November 1992.

Table 9.13
Growth Limitations Based on Solid Waste Transfer Facility Capacity

Transfer Facility	Current Demand		Design Capacity	
	TPD	ERU's	TPD	ERU's
Key Largo	90	14,754	200	32,786
Long Key	100	16,393	400	65,574
Cudjoe Key	60	9,836	200	32,786
Total	250	40,984	900	147,541

Source: Keith and Schnars, P.A., 1991, Revised 9/23/92.

Table 9.14
Growth Limitations Based on Haul Out Contract Limitations

	TONS PER YEAR	ERU's
WMI Haul Out Contract Maximum Tonnage	95,000	42,668
Actual Total 1991 Haulout Tonnage	73,252	32,900
Remaining Capacity	21,748	9,768
Committed Development (1)	7,507	3,372
Net Remaining Capacity	14,241	6,396

Notes:

(1) Committed Development is calculated as: 2087 permitted residential units x 5.44lbs/person/day x 2.24 persons/household = 25,431 lbs/day residential plus 392,545 s.f. permitted non-residential x .04 lbs/s.f. (SFRPC Standard) = 41,133 lbs x 365 days/2000 lbs. = 7,507 tons per year (TPY x 2000 lbs /365 days = 41,133 lbs/12.2 lbs/day/ERU= 3,372 ERU's.

(2) The haulout tonnage is the scale tonnage, based on the Fiscal Year, October 1, 1990 to September 30, 1991.

Sources: Division of Environmental Management, 1992
Keith and Schnars, P.A., 1992

Bibliography

Florida, Department of Environmental Regulation, Division of Waste Management, "Solid Waste Management in Florida, 1989 Annual Report."

Monroe County Growth Management Division, "Materials on Solid Waste Level of Service." February 1, 1989.

Monroe County Environmental Management Division, Consulting Engineering Services for Sludge,Septage and/or Leachate Management Program. December 1991.

Monroe County, Hazardous Waste Assessments, Component Two, Identification of Abandoned Dump Sites. No Date.

Monroe County Planning Department, "Monroe County Public Facilities Capacity 1991 Assessment." 1991

Monroe County Planning Department, "Annual Assessment of Public Facilities Capacity." March 1989.

Monroe County Planning Department, Florida Key's Comprehensive Plan, Vol. I and II. 1986

Monroe County Recycling Department, Materials compiled for the "Solid Waste Recycling and Education Grant Application." September 1991.

Monroe County, Monroe County Transfer Stations Design and Construction Agreement between Monroe County, Florida and Waste Management Inc. of Florida. August 1990.

Monroe County, Lease Agreement between Board of County Commissioners of Monroe County, Florida and Waste Management Inc. of Florida. August 1990.

Monroe County, Standby Disposal Agreement between Monroe County Florida and Waste Management Inc. August 1990.

South Florida Regional Planning Council, Regional Plan for South Florida. August 1991